

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference P 1381PC00	<b>FOR FURTHER ACTION</b>		See item 4 below
International application No. PCT/DE2004/002286	International filing date ( <i>day/month/year</i> ) 14 October 2004 (14.10.2004)	Priority date ( <i>day/month/year</i> ) 16 October 2003 (16.10.2003)	
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237			
Applicant FUTURE CARBON GMBH			

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).
2. This REPORT consists of a total of 7 sheets, including this cover sheet.  
  
In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

- |                                     |              |   |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I    | Basis of the report   |
| <input type="checkbox"/>            | Box No. II   | Priority  |
| <input type="checkbox"/>            | Box No. III  | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| <input type="checkbox"/>            | Box No. IV   | Lack of unity of invention  |
| <input checked="" type="checkbox"/> | Box No. V    | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/>            | Box No. VI   | Certain documents cited   |
| <input type="checkbox"/>            | Box No. VII  | Certain defects in the international application  |
| <input type="checkbox"/>            | Box No. VIII | Certain observations on the international application   |

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No. +41 22 338 82 70		Date of issuance of this report 27 July 2006 (27.07.2006)  Authorized officer  <b>Agnes Wittmann-Regis</b>  e-mail: pt06@wipo.int
---	--	--

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

# PCT

**Translation**

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To:

Date of mailing **See Form PCT/ISA/210**  
(day/month/year) **(sheet 2)**

Applicant's or agent's file reference  
**P 1381PC00**

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
**PCT/DE2004/002286**

International filing date (day/month/year)  
**14.10.2004**

Priority date (day/month/year)  
**16.10.2003**

International Patent Classification (IPC) or both national classification and IPC  
**H01M4/58, C04B41/53**

Applicant  
**FUTURE CARBON GMBH**

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/EP

Authorized officer

Facsimile No.

Telephone No.

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/DE2004/002286

Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐

This opinion has been established on the basis of a translation from the original language into the following language

\_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (under Rule 12.3 and 23.1(b)).

2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

- a. type of material

☐

a sequence listing

☐

table(s) related to the sequence listing

- b. format of material

☐

in written format

☐

in computer readable form

- c. time of filing/furnishing

☐

contained in the international application as filed.

☐

filed together with the international application in computer readable form.

☐

furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/DE2004/002286

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	9	YES
	Claims	1-8, 10-29	NO
Inventive step (IS)	Claims		YES
	Claims	1-29	NO
Industrial applicability (IA)	Claims	1-29	YES
	Claims		NO

2. Citations and explanations:

1. Reference is made to the following documents:

D1: JP 10 092 432 A (also see the PAJ abstract)  
D2: JP 2000 223 121 A (also see the PAJ abstract)  
D3: J. Mater. Res. 11, 2811 (1996)  
D4: US 5 919 589 A

2. The present application does not meet the requirements  
of PCT Article 6 for the following reasons:

2.1 The term "approximately at standard pressure" which  
is used in claim 5 does not have a generally recognized  
meaning and is therefore unclear.

2.2 Dependent claim 22 which defines the feature  
"modified edges" in more detail refers back to  
independent claims 20 and 21. However, modified edges are  
not mentioned in claim 21.

3. The present application does not meet the requirements  
of PCT Article 33(1) because the subject matter of claims  
1-8 and 10-29 is not novel within the meaning of PCT  
Article 33(2) for the following reasons:

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/DE2004/002286

Box No. V

Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

3.1 In the PAJ abstract, D1 discloses a carbon powder for producing an electrode material for lithium batteries. The properties of this powder are modified by a high-frequency plasma treatment in which the starting material is introduced into the plasma using a carrier gas (also see figure 1). The subject matter of independent claims 1, 13, 21 and 25 is thus not novel over D1.

3.2 The subject matter of independent claim 20 is not novel over D1 since the present application shows that the edges of the material are modified by plasma-treating carbon powder.

3.3 The subject matter of independent claim 28 is not novel over D1 since D1 discloses, in paragraphs [0038] to [0049], that the plasma-modified carbon material can be mixed with other substances, for example a binder, a metal oxide, a metal sulphide and/or a conductive polymer.

3.4 The subject matter of dependent claims 2-6, 14-18, 22-24, 26, 27 and 29 is likewise disclosed in the abovementioned passages of D1.

3.5 Paragraph [0027] of D1 discloses that the plasma gas may contain oxygen and argon. Therefore, the subject matter of claims 8, 10 and 11 is likewise not novel over D1.

3.6 Paragraph [0025] of D1 discloses that the frequency of the high-frequency field is between 0.5 and 6 MHz, and

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/DE2004/002286

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

a frequency of 4.5 MHz is used in the example. Therefore, the subject matter of claim 12 is likewise not novel over D1.

3.7 The subject matter of claims 1-6, 8, 10-18 and 20-29 is also not novel over D2 which discloses the plasma treatment of carbon powder, which can be used to produce electrodes, using the same high-frequency apparatus as described in D1 (see the PAJ abstract and figure 1). The use of a mixture of oxygen and argon as the plasma gas is disclosed in paragraph [0036] of D2. The use as an additive to a composite material, which also contains a binder, an electrically conductive substance and a metal oxide, metal sulphide or a conductive polymer, is mentioned in paragraphs [0046] to [0049] and [0056].

3.8 D3 discloses the plasma treatment of titanium carbide powders, as described in the abstract and in the chapter entitled "Experimental". In this case, use is made of the same high-frequency plasmatron as in D1 and D2, it also being mentioned that the plasma-treated powder is collected on a filter (see the sentence which spans the right-hand and left-hand column of page 2812). Therefore, the subject matter of claims 1, 3-8 and 10-19 is also not novel over D3.

3.8 In example 2, D4 discloses lithium rechargeable batteries having carbon anodes. In order to produce the anodes which comprise a composite material of carbon and binder, use is made of a carbon powder which is treated with a hydrogen high-frequency plasma. Therefore, the subject matter of claims 1, 2, 8, 11, 13, 14, 17, 21 and

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/DE2004/002286

Box No. V

Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

24-29 is also not novel over D4.

4. The present application does not meet the requirements of PCT Article 33(1) because the subject matter of claim 9 does not involve an inventive step within the meaning of PCT Article 33(3). The range of oxygen content specified in this claim is within the conventional range which a person skilled in the art would choose when producing the mixture of oxygen and argon disclosed in D1 and D2.

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

# PCT

**Translation**

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To:

Date of mailing **See Form PCT/ISA/210**  
(day/month/year) **(sheet 2)**

Applicant's or agent's file reference  
**P 1381PC00**

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
**PCT/DE2004/002286**

International filing date (day/month/year)  
**14.10.2004**

Priority date (day/month/year)  
**16.10.2003**

International Patent Classification (IPC) or both national classification and IPC  
**H01M4/58, C04B41/53**

Applicant  
**FUTURE CARBON GMBH**

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/EP

Authorized officer

Facsimile No.

Telephone No.



WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/DE2004/002286

Box No. I

Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐

This opinion has been established on the basis of a translation from the original language into the following language

\_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (under Rule 12.3 and 23.1(b)).

2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a. type of material

☐

a sequence listing

☐

table(s) related to the sequence listing

b. format of material

☐

in written format

☐

in computer readable form

c. time of filing/furnishing

☐

contained in the international application as filed.

☐

filed together with the international application in computer readable form.

☐

furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/DE2004/002286

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	9	YES
	Claims	1-8, 10-29	NO
Inventive step (IS)	Claims		YES
	Claims	1-29	NO
Industrial applicability (IA)	Claims	1-29	YES
	Claims		NO

2. Citations and explanations:

1. Reference is made to the following documents:

D1: JP 10 092 432 A (also see the PAJ abstract)  
D2: JP 2000 223 121 A (also see the PAJ abstract)  
D3: J. Mater. Res. 11, 2811 (1996)  
D4: US 5 919 589 A

2. The present application does not meet the requirements  
of PCT Article 6 for the following reasons:

2.1 The term "approximately at standard pressure" which  
is used in claim 5 does not have a generally recognized  
meaning and is therefore unclear.

2.2 Dependent claim 22 which defines the feature  
"modified edges" in more detail refers back to  
independent claims 20 and 21. However, modified edges are  
not mentioned in claim 21.

3. The present application does not meet the requirements  
of PCT Article 33(1) because the subject matter of claims  
1-8 and 10-29 is not novel within the meaning of PCT  
Article 33(2) for the following reasons:

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/DE2004/002286

Box No. V

Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

3.1 In the PAJ abstract, D1 discloses a carbon powder for producing an electrode material for lithium batteries. The properties of this powder are modified by a high-frequency plasma treatment in which the starting material is introduced into the plasma using a carrier gas (also see figure 1). The subject matter of independent claims 1, 13, 21 and 25 is thus not novel over D1.

3.2 The subject matter of independent claim 20 is not novel over D1 since the present application shows that the edges of the material are modified by plasma-treating carbon powder.

3.3 The subject matter of independent claim 28 is not novel over D1 since D1 discloses, in paragraphs [0038] to [0049], that the plasma-modified carbon material can be mixed with other substances, for example a binder, a metal oxide, a metal sulphide and/or a conductive polymer.

3.4 The subject matter of dependent claims 2-6, 14-18, 22-24, 26, 27 and 29 is likewise disclosed in the abovementioned passages of D1.

3.5 Paragraph [0027] of D1 discloses that the plasma gas may contain oxygen and argon. Therefore, the subject matter of claims 8, 10 and 11 is likewise not novel over D1.

3.6 Paragraph [0025] of D1 discloses that the frequency of the high-frequency field is between 0.5 and 6 MHz, and

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/DE2004/002286

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

a frequency of 4.5 MHz is used in the example. Therefore, the subject matter of claim 12 is likewise not novel over D1.

3.7 The subject matter of claims 1-6, 8, 10-18 and 20-29 is also not novel over D2 which discloses the plasma treatment of carbon powder, which can be used to produce electrodes, using the same high-frequency apparatus as described in D1 (see the PAJ abstract and figure 1). The use of a mixture of oxygen and argon as the plasma gas is disclosed in paragraph [0036] of D2. The use as an additive to a composite material, which also contains a binder, an electrically conductive substance and a metal oxide, metal sulphide or a conductive polymer, is mentioned in paragraphs [0046] to [0049] and [0056].

3.8 D3 discloses the plasma treatment of titanium carbide powders, as described in the abstract and in the chapter entitled "Experimental". In this case, use is made of the same high-frequency plasmatron as in D1 and D2, it also being mentioned that the plasma-treated powder is collected on a filter (see the sentence which spans the right-hand and left-hand column of page 2812). Therefore, the subject matter of claims 1, 3-8 and 10-19 is also not novel over D3.

3.8 In example 2, D4 discloses lithium rechargeable batteries having carbon anodes. In order to produce the anodes which comprise a composite material of carbon and binder, use is made of a carbon powder which is treated with a hydrogen high-frequency plasma. Therefore, the subject matter of claims 1, 2, 8, 11, 13, 14, 17, 21 and

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/DE2004/002286

Box No. V

Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

24-29 is also not novel over D4.

4. The present application does not meet the requirements of PCT Article 33(1) because the subject matter of claim 9 does not involve an inventive step within the meaning of PCT Article 33(3). The range of oxygen content specified in this claim is within the conventional range which a person skilled in the art would choose when producing the mixture of oxygen and argon disclosed in D1 and D2.